

SOURCES OF TWO UNUSUAL RAINFALL RECORDS.

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Two records of extremely unusual rainfall for the northeastern part of the United States have been printed in various publications on meteorology, hydrology, and related subjects; but in no instance, so far as the writer can find, have references been made to the original sources of information. Greely's "American Weather" probably furnished the data on the 1843 storm for many of the more recent articles; but he gives no clue as to where he obtained his information. The storms in question are those of July 26, 1819, in which 18 inches of rain fell in 7½ hours at Catskill, N. Y., and August 5, 1843, when 16 inches fell in 3 hours, at Concord, Pa.

Being engaged recently on a study of excessive rainfall for the Morgan Engineering Co., the question naturally arose as to whether the above records were obtained from actual measurements in rain-gages, by regular observers, or from more or less crude measurements in pails, tubs, or similar receptacles, by untrained persons. Investigation soon disclosed the fact that they are not official records; that is, they can not be found among the official rainfall records taken under the direction of the Surgeon General of the United States Army and now in the custody of the United States Weather Bureau. After a rather lengthy search the source of the Catskill record was found to be an article by Benjamin W. Dwight in the *American Journal of Science and Arts*, sometimes referred to as *Silliman's Journal*, Volume IV, 1822, pages 124 to 142; and the source of the Concord record, a report of a committee appointed by the Delaware County Institute of Science, immediately after the flood, to investigate the great rainstorm and flood of August 5, 1843. The latter was reprinted by the Institute in their proceedings of October, 1910, and January, 1911.

Dwight's article is a well-written, clear description of the Catskill storm and of the damage it caused. Apparently he made a careful and lengthy investigation of the conditions at the time. He gave the duration of the rainfall as from 3.30 to 11 p. m., but said that the extreme violence of the rain terminated before 6.30 p. m. Several instances are noted of pails and tubs, 15 or 16 inches deep, empty when the rain began, being filled before sunset. The source of the 18-inch record was evidently the following statements:

About 6 miles south of the courthouse an empty barrel, in the open, caught 18 inches. I am persuaded that the water fell fully 15 inches on the level over a tract of about 80 square miles. On a considerable part of the tract there is reason to believe that the quantity exceeded 18 inches.

Of course such records are somewhat open to question. It is likely that the duration of the rain, as given, is about right, but that the depths are too large. However, in view of the number of measurements made, it seems probable that some one of them, at least, would be accurate within 25 per cent, which would still indicate a very unusual downpour. It is doubtful if the estimate of 15 inches over 80 square miles can be relied upon.

The report made by the committee of the Delaware County Institute of Science on the storm of August, 1843, was much more detailed than Dwight's article. The original pamphlet consisted of 52 closely printed 8 vo. pages. The members of the committee made field inspections throughout the flooded sections and also wrote letters of inquiry to the more prominent citizens.

The descriptions of the storm, of the unusual floods it caused, of the loss of life, and of the property damage

are unusually well prepared. However, the rainfall data is not so satisfactory. Only general statements are made regarding the depths in the different parts of the county where the precipitation was most intense. The conclusions were undoubtedly based on actual measurements in pails, tubs, and the like, but the specific instances are not related. In this respect the report is inferior to Dwight's.

The Concord record of 16 inches in three hours was evidently based on the statement—

In the neighborhood of Concord the rain continued about three hours, and the quantity of rain which fell in that vicinity, as nearly as ascertained, was about 16 inches.

Additional statements regarding rainfall, which are probably the sources of other records published for this storm, are as follows:

As observed by Mr. Adam B. Williamson, of Newtown Township, the heavy rain commenced about 2 o'clock and terminated about 5 o'clock p. m., the wind during the rain nearly northwest. There was a heavy blow of wind, but not violent. The quantity of rain which fell was between 11 and 13 inches. At Newtown Square, in 40 minutes immediately before 5 o'clock, it was ascertained that 5½ inches of rain fell.

From well authenticated information, which he (Prof. Frazer, of Philadelphia) received from Mrs. Grubb, in Brandywine Hundred (Delaware), near the State line, he is perfectly satisfied that the fall of rain at that place exceeded 10 inches in about two hours.

Thus it appears that the records for the storm of 1843 are also somewhat open to question. That the rainfall was very unusual, however, is indicated by the magnitude of the floods it caused. The maximum stages in Chester, Ridley, Crum, and Darby Creeks were higher than had been previously known or than has occurred since.

NEW METHOD OF CONSTRUCTING AVERAGE MONTHLY RAINFALL MAPS.¹

By M. DE C. S. SALTER.

[Abstract reprinted from *Science Abstracts*, Aug. 31, 1921, §1389, p. 550.]

The method consists in combining the average monthly isomeric maps individually with a detailed isohyetal map showing average annual rainfall, thus producing average monthly isohyetal maps. For the construction of isomeric maps the average monthly rainfall for each station is expressed as percentage of the average annual rainfall of that station, and isomers are lines of equal percentage. It has been established that such maps are much less complex than isohyetal maps, being less dependent on orographical features, and can be drawn with relatively few stations, say, 200 for the British Isles. Isohyetal maps, on the other hand, require at least 2,000 stations, and are difficult to construct directly for monthly averages, owing to lack of knowledge of the relation of monthly rainfall to configuration, though this is fairly well known for annual totals and has been used in the construction of the detailed annual map. The indirect method has accordingly been utilized for the British Isles in a way fully described in the paper, which aims at bringing the method forward for discussion, and not at discussing the climatological results. A long discussion followed, the general opinion being that for the purpose in view the method is justified.—M. A. G.

¹ *Journal of the Royal Meteorological Society*, 47:101-116, April, 1921.